Rare Earth Metals: the economics, politics, and geography behind the ‘new gold’

Acknowledgements to ‘The Economist’, and various Wikipedia items

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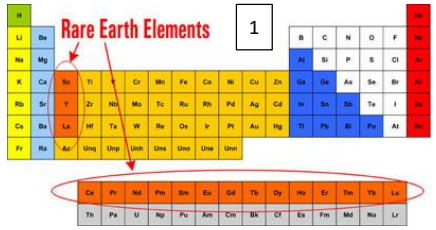

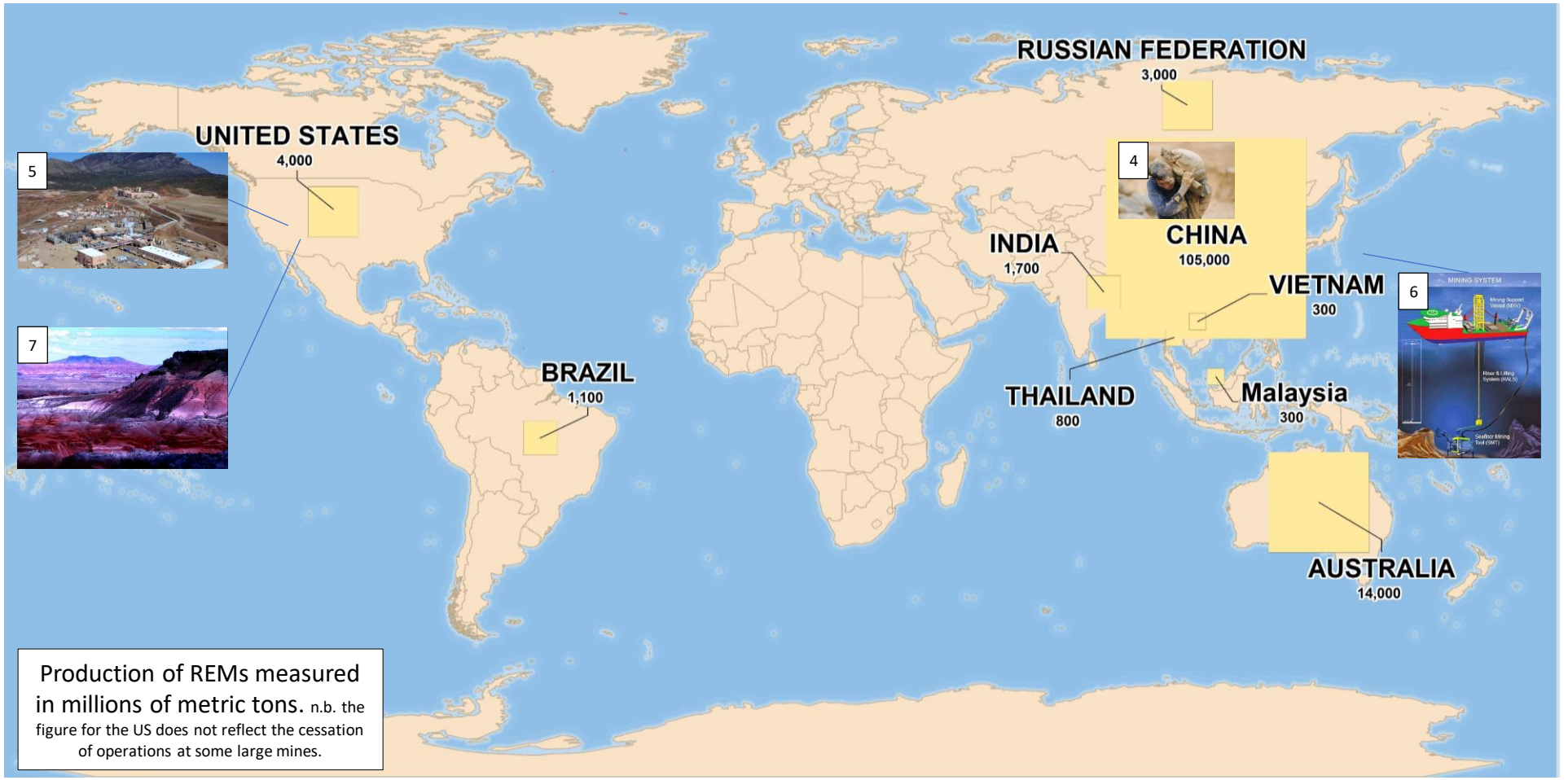

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Rare Earth Metals (REM) are a group of 17 chemically similar elements **[1]** crucial to the manufacture of many hi-tech products. Despite their name, most are abundant in nature but are hazardous to extract. Their uses are diverse, but are generally associated with the production of advanced technology including computer memory, rechargeable batteries, cell phones, catalytic converters, magnets, fluorescent lighting and much more. To give just one example, every Toyota Prius has over 25 pounds of lanthanum in its nickel-metal hydride battery. **[2].** During the past two decades, there has been an explosion in demand for many items that require REMs. REMs also play an essential role in advanced military technology. Better-equipped armed forces use night-vision goggles, precision-guided weapons, communications equipment, GPS equipment, batteries, and other electronics. **[3].** Far-sighted government policy from the mid 1960s has led to China being the overwhelmingly dominant supplier of REMs.

What makes the REMs so special is the way they can react with other elements to get results that each could not achieve alone. The problem is that, though widely dispersed, REMs occur in extremely low concentrations. Only a handful or so places exist—in Australia, Brazil, Canada, China, India, South Africa and the United States—where deposits have been found rich enough to justify mining them. Even then, ‘abundance’ is usually measured in concentrations of one or two percent. The largest source today is a by-product of China's huge iron-ore mining operations in Inner Mongolia, which helps supply China’s extraordinary industrial expansion.

Because of their similar chemical properties, REMs tend to clump together in rocks, often along with radioactive thorium or uranium. That makes extracting, separating and refining them difficult and dangerous for manual workers. Handling the radioactive and chemical waste produced in the process adds significantly to the cost. Low environmental standards and wages, have allowed Chinese producers to undercut competitors abroad**. [4].** With burgeoning demand for REMs in the domestic market, the Chinese government has cut back significantly on their export. For decades, the mine and processing plant at Mountain Pass, owned by Molycorp Minerals of Colorado, was the biggest supplier of REMs in the world **[5]**, extracting as much as 20,000 tons of ore a day. It was europium from Mountain Pass, for instance, that made colour television possible. Since 2002, however, the huge open-cast mine there has been dormant, a victim of China's drastically lower labour costs; California's increasingly stringent environmental requirements; and, delays by state regulators in renewing the mine's operating licence. The change in Chinese export policy has now improved the outlook for operations such as at Mountain Pass, and they look increasingly viable once again. Other sources of REMs are also being explored, and these include recovery from the tailings of previous extractions of certain elements; recycling of disused/unused electronics; and, also from undersea sources- In January 2013 a Japanese deep-sea research vessel obtained seven promising deep-sea mud core samples from the Pacific Ocean seafloor at 5,600 to 5,800 meters depth, approximately 250 kilometres (160 mi) south of the island of Minami-Tori-Shima. **[6].** Minerals perhaps containing viable deposits of REMs may be found all over the world, especially where iron deposits paint the landscape as red as northern Arizona, in the Painted Desert National Park. But a look at this staggeringly beautiful landscape, reinforces that REMs cannot and should not be extracted at any cost. **[7]**